

PERIODIC TABLE

Quick Review: Parts of Atoms

- **Protons** =
 - Positive charge
 - Found in nucleus
 - Contribute to mass of atom
- **Neutrons** =
 - Neutral (no charge)
 - Found in nucleus
 - Contribute to mass of atom

- **Electrons** =
 - Negative charge
 - Orbit the nucleus
 - Have almost no mass
- A neutral atom has the same number of electrons and protons

Overview of the Periodic Table

- *Dmitry Mendeleev* created a functional scheme with which to classify elements based on their chemical properties
- The periodic table is made up of rows and columns of elements
 - A row is called a **period**
 - Corresponds to the number of energy levels
 - A column is called a **group**

Breaking Down Each Block

- An element is identified by its chemical symbol
- **Atomic number** =
 - The **number** of protons in an atom of a particular element
 - Whole number (found above symbol in Periodic Table)
- **Atomic mass** =
 - The **mass** of the entire atom
 - Remember, most of an atom's mass is in the nucleus
 - Also called atomic weight
 - Does NOT have to be a whole number (found below symbol in Periodic Table)

- **Mass number** =

- The **number** of protons and neutrons in an atom
- Can be found by rounding the atomic mass to the nearest whole number

METALS VERSUS NONMETALS

Metals =

- Most elements are metals
- Typically solid at room temperature
- Good conductors of heat and electricity
- Can be pounded into sheets
 - Malleable
- Can be drawn into a wire
 - Ductile
- Reflect light/shine
 - Luster

Nonmetals =

- Poor conductors
- Cannot be pounded into sheets
 - Not malleable
- Cannot be rolled into wires
 - Not ductile
- Do not reflect light/shine
 - No luster

Metalloids =

- Have properties of metals and non-metals

CHEMICAL BONDING

- **Chemical bonds** =

- Attraction between atoms resulting from the sharing or transfer of electrons
- The bond itself is NOT matter!

- **Covalent bonds** =

- Attraction between two atoms in which electrons are **shared** between them
- Form between nonmetals and other nonmetals
 - Example: Sugar

– **ionic bonds** =

- Attraction between oppositely charged ions in which electrons are **transferred** from one atom to another
- Form between metals and nonmetals
 - Example: Salt

– **ion** =

- An atom that has lost or gained one or more electrons, giving it a positive or negative charge

– **Cation** =

- A positively charged ion
- It has less electrons than protons

– **Anion** =

- A negatively charged ion
- It has more electrons than protons

NOTE:

- Changing the number of electrons in an atom results in an ion
- But changing the number of protons in an atom results in a completely different element!

Why do *Elements* sometimes bond together to form *Compounds*?

- Elements want to be stable
 - Sometimes they are more stable when they transfer or share electrons to form compounds
- ***Valence electrons*** =
 - The electrons in the highest energy level of an atom
 - They can be gained or lost in a chemical reaction

- **Octet rule** =
 - Atoms tend to gain, lose, or share electrons in order to have eight electrons in their highest energy level
 - IE: Atoms are typically most stable when they have eight valence electrons
- Exceptions
 - Hydrogen and Helium
 - Their highest energy level only holds 2 electrons

CHEMICAL FAMILIES

Alkali metals =

- Found in Group 1 of periodic table
 - Previously called Group IA
- The most reactive metals
 - Have one valence electron
- Softer than most other metals
- Elements
 - Lithium
 - Sodium
 - Potassium
 - Rubidium
 - Cesium
 - Francium

Alkaline earth metals =

- Found in Group 2
 - Previously called Group IIA
- Very reactive
 - But not as reactive as alkali metals
 - Have two valence electrons
- Elements
 - Beryllium
 - Magnesium
 - Calcium
 - Strontium
 - Barium
 - Radium

Transition metals =

- Found in Groups 3 through 12
- 38 elements
- Iron, cobalt, and nickel produce a magnetic field

Rare earth elements =

- Found in Group 3 (6th and 7th periods)
- Composed of **lanthanide** and **actinide** series
- Many are man-made
- 30 elements

Poor metals =

- Found in Groups 13, 14, and 15
- Relatively high density
- Opaque
- Elements
 - Aluminum, Gallium, Indium, Tin, Thallium, Lead, Bismuth

Metalloids =

- Found along the stair-step line that distinguished metals from non-metals
- Have properties of both metals and non-metals
 - Semi-conductors
- Useful in computers and calculators
- Elements
 - Boron, Silicon, Germanium, Arsenic, Antimony, Tellurium, Polonium

Nonmetals =

- Found in Groups 14, 15, and 16
- Brittle
- Elements
 - Hydrogen, Carbon, Nitrogen, Oxygen, Phosphorus, Sulfur, Selenium

Halogens =

- Found in Group 17
 - Previously called Group VIIA
- Very reactive non-metallic elements
 - Need one more valence electron to fill highest energy level
- Means “salt-former”
- Elements
 - Fluorine
 - Chlorine
 - Bromine
 - Iodine
 - Astatine

Noble Gases =

- Found in Group 18
 - Previously called Group Zero
- Stable
 - Highest energy level of electrons is full
- Exist as gases only
- Elements
 - Helium
 - Neon
 - Argon
 - Krypton
 - Xenon
 - Radon